PATENT ABSTRACTS OF JAPAN

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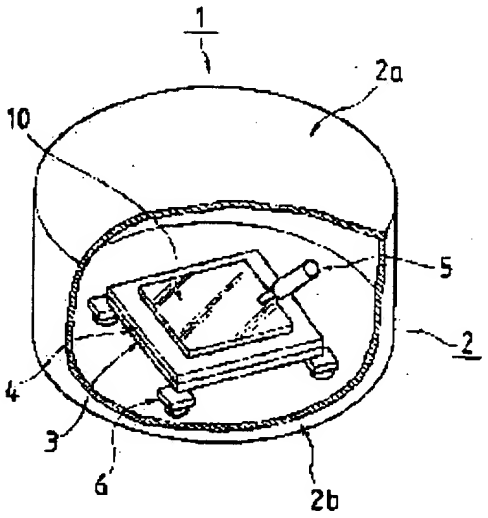
(54) LIQUID CRYSTAL INJECTING DEVICE

(57) Abstract:
PROBLEM TO BE SOLVED: To provide the liquid crystal injecting device which can heat the whole substrate at uniform temperature and holds the substrate at specific temperature and is able to reduce the loss of a liquid crystal material.
SOLUTION: A support part 4 which supports at least a substrate 10 and has a plane support surface with good heat conductivity and a heating means and a liquid crystal discharge part 5 which can discharge liquid crystal to the support surface side of the support part are put in a container 2. The whole substrate mounted on the support surface has a uniform temperature distribution by giving good heat conductivity to the support surface for supporting at least the substrate 10 and the temperature of the support part 4 can be controlled by the heating means. Further, the liquid crystal discharge part 5 is provided to directly inject the liquid crystal material into the liquid crystal injection hole of the substrate.



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* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] Especially this invention relates to the liquid crystal injector for pouring in liquid crystal into the substrate of a liquid crystal panel about semiconductor fabrication machines and equipment.
[0002]
[Description of the Prior Art] Manufacture of a liquid crystal panel manufactures a glass substrate, and is performed by the various processes that the cell erector who assembles the cell of the glass-substrate process which performs surface treatment, the pattern formation process which forms the pattern of TFT in each of the pixels of a display, the light-filter formation process of manufacturing a light filter, and a liquid crystal substrate attaches a mechanical-component article and a back light, such as a module-assembly process.
[0003] The process which pours in liquid crystal material into the empty cell in the substrate which sticks two glass substrates and is formed is included like the cell erector of each above-mentioned process. Conventionally, the DIP method which soaks a substrate in liquid crystal material and sucks up liquid crystal material in a substrate as a method of pouring in liquid crystal material into this substrate is learned. A substrate is dipped into the tank containing liquid crystal material, and liquid crystal material is sucked up in an empty cell by capillarity and the pressure differential at the same time it sends in inert gas, such as nitrogen gas, in a bell jar and considers as atmospheric pressure, after also making the inside of an empty cell into a vacua by putting in the tank in which a substrate and liquid crystal material entered in the box called metal bell jar by this DIP method, deaerating the inside of a bell jar, and considering as a vacua.
[0004] Drawing 5 is a schematic diagram for explaining the conventional liquid crystal injector. The conventional liquid crystal injector 20 is equipped with the tank 22 which paid the liquid crystal ingredients 23 in the bell jar 21 in drawing 5 . By dipping a substrate 10 into the liquid crystal material 23 in this tank 22, the liquid crystal material 23 is poured in into the empty cell in a substrate 10. In a bell jar 21, in order to make easy pouring of the liquid crystal material into an empty cell, the blower 24 which raises the temperature of a substrate 10 is formed. Moreover, a sign 25 is a pipe for lengthening the inside of a bell jar 21 to a vacuum, or pouring in inert gas.
[0005]
[Problem(s) to be Solved by the Invention] Although the conventional liquid crystal injector is heating the substrate by applying hot blast to a substrate directly from a blower, it has the trouble that the temperature control of a substrate -- it is difficult to heat the whole substrate uniformly, and it is difficult also for setting a substrate as predetermined temperature -- is difficult, in heating using this blower. The temperature unevenness of a substrate also becomes the cause which unevenness produces in pouring of the liquid crystal material into the empty cell in a substrate.
[0006] Moreover, since the conventional liquid crystal injector is a DIP method held by dipping a substrate in liquid crystal material, it has the trouble that the loss of liquid crystal material -- a lot of

liquid crystal material is required, and liquid crystal material is applied also to portions other than the liquid crystal inlet of a substrate -- is large.

[0007] Therefore, this invention aims at offering the liquid crystal injector which can decrease the loss of liquid crystal material for the purpose of offering the liquid crystal injector which can solve the conventional trouble, and can heat the whole substrate to uniform temperature, and can set a substrate as predetermined temperature.

[0008]

[Means for Solving the Problem] The liquid crystal injector of this invention places a substrate on the installation side of a supporter, it performs liquid crystal pouring by pouring in liquid crystal material from the liquid crystal inlet of this substrate, controls the temperature of a substrate by heating of a supporter, pours in liquid crystal material directly from the liquid crystal inlet of this substrate, and makes the temperature control of a substrate possible by this, and performs few liquid crystal pouring of a loss.

[0009] The supporter equipped with the back face and heating means of the flat surface which the liquid crystal injector of this invention supports a substrate at least, and has right thermal conductivity, By considering the liquid crystal regurgitation section which makes the regurgitation of liquid crystal possible at the back-face side of this supporter as the composition which it had in the container, and making into right thermal conductivity the back face which supports a substrate at least Pouring of liquid crystal material is directly enabled from the liquid crystal inlet of a substrate by making it become temperature distribution with the whole uniform substrate laid on this back face, and this supporter's making a temperature control possible by the heating means, and preparing the liquid crystal regurgitation section and.

[0010] Thermal conductivity can constitute a back face from a good material, and it can heat the whole substrate laid by this on a back face to uniform temperature. As a good material, thermal conductivity can use materials, such as aluminum and stainless steel, for example.

[0011] Moreover, a supporter is equipped with a heating means and makes a temperature control possible by controlling the grade of heating. A heating means can use the heater and piezo-electric element which used resistance wire, and the temperature control of it becomes possible by controlling the voltage and current to impress. Moreover, equipment separate from supporting section constituting a heating means, and connecting and constituting both can also be constituted by the equipment of one which included the heating means in supporting section.

[0012] The liquid crystal regurgitation section is the means which can carry out the regurgitation of the liquid crystal material of the specified quantity, and can pour in liquid crystal material directly into a substrate by carrying out alignment of the nozzle nose of cam of this regurgitation section to the liquid crystal inlet of a substrate, and carrying out the regurgitation of the liquid crystal material into this liquid crystal inlet.

[0013] According to the liquid crystal injector of this invention, a substrate is laid on the back face of a supporter and a supporter is heated by the heating means of a supporter. At least, since [of a supporter] a back face has right thermal conductivity, a back face is controlled by uniform temperature. Therefore, it can heat to temperature also with the uniform substrate laid on this back face. Alignment of the nozzle of the liquid crystal regurgitation section is carried out to the liquid crystal inlet of a substrate, and liquid crystal material is poured into the interior of a substrate through this liquid crystal inlet. Since the substrate is heated uniformly, it fills up with the poured-in liquid crystal material that there is no unevenness in a substrate. Moreover, since liquid crystal material can be directly poured into a liquid crystal inlet, the loss of liquid crystal material can be reduced.

[0014] At least on the other hand, the 1st embodiment of this invention enables movement of the liquid crystal regurgitation section to the back face of a supporter at **, and it can carry out alignment to the liquid crystal inlet of the substrate laid by this on the back face.

[0015] A supporter can be equipped with a temperature detection means, and the 2nd embodiment of this invention can detect the temperature of a supporter, and can perform the temperature control of a back face by feeding back to a heating means.

[0016]
[Embodiments of the Invention] Hereafter, the gestalt of operation of this invention is explained in detail, referring to drawing. The example of composition of the gestalt of operation of this invention is explained using the perspective diagram for explaining the operation gestalt of drawing 1 and the liquid crystal injector of this invention of 2 and 3, front view, and a cross section.
[0017] The liquid crystal injector 1 is equipped with the container 2 containing container base 2b and covering 2a, and the building envelope formed in this container 2 can be sealed, and it can perform insertion and ejection of a substrate 10 in drawing 1 , and 2 and 3. On container base 2b, the base 3 and a supporter 4 are installed through the insulating supporter 6.
[0018] A supporter 4 is a member which heats by supporting a substrate 10, and is equipped with the plane back face and the plane heating means of having right thermal conductivity. The thermal conductivity of aluminum, stainless steel, etc. can constitute a back face from a good material. By making thermal conductivity of a back face good, the time of the temperature control of a back face can be shortened, and the unevenness of the temperature distribution of a back face can be decreased.
[0019] A heating means can use the heater and piezo-electric element which used resistance wire. A temperature control is possible for a heating means by controlling the voltage and current which receive and impress supply of power through the line 7 linked to the exterior of a container 2. In addition, equipment separate from a supporter 4 constituting this heating means, and connecting and constituting both can also be constituted by the equipment of one incorporated in the supporter 4.
[0020] furthermore, the supporter 4 -- a temperature detection means (not shown) -- having -- the temperature of a back face or a heating means -- detecting -- a line 8 -- letting it pass -- an external control unit (not shown) -- transmitting . A control unit receives the detected temperature signal, controls the voltage or current supplied to a heating means, and performs a temperature control to predetermined temperature.
[0021] A substrate 10 is contacted and laid on the back face of a supporter 4, and is heated by the back face at predetermined temperature. With good thermal conductivity, since back faces are uniform temperature distribution, they serve as temperature distribution also with the uniform substrate 10 laid on this back face. In addition, by the insulating supporter 6, to container base 2b, it insulates electrically and thermally and a supporter 4 and the base 3 are attached.
[0022] Moreover, the liquid crystal regurgitation section 5 is formed in a container 2. The liquid crystal regurgitation section 5 breathes out liquid crystal material, is equipment which pours in liquid crystal material into the liquid crystal inlet of a substrate 1, and can be made into the mechanism equipped with the nozzle which carries out the regurgitation of the liquid crystal material. The regurgitation point of the liquid crystal regurgitation section 5 which carries out the regurgitation of the liquid crystal material, such as a nozzle nose of cam, at least is arranged so that it may become the substrate 10 top laid on the back face of a supporter 4, and it is constituted so that the liquid crystal material breathed out from the regurgitation point may reach the liquid crystal inlet of a substrate.
[0023] In the liquid crystal injector of the above-mentioned composition, the following procedures can perform pouring of the liquid crystal into a substrate 10. First, a substrate 10 is inserted into a container 2 and it lays on the back face of a supporter 4. After laying, the heating means with which a supporter 4 is equipped is driven, and a back face is heated to predetermined temperature. Liquid crystal material makes predetermined temperature of this back face the temperature of the grade which shows the fluidity suitable for pouring. A temperature control can be performed by feeding back the temperature signal detected with the temperature detection means.
[0024] The substrate 10 laid on the back face is heated by the back face by which the temperature up was carried out at predetermined temperature. Pouring into the substrate 10 which breathed out liquid crystal material from the liquid crystal regurgitation section 5 is performed to this heated substrate 10. In addition, in this pouring, pouring processing can be performed by the operation at which liquid crystal material is made only dropped from a regurgitation point by the alignment of the liquid crystal inlet of a regurgitation point and substrates, such as a nozzle of the liquid crystal regurgitation section 5.
[0025] Alignment of this liquid crystal regurgitation section and a liquid crystal inlet can be performed

by setting up the installation position of the liquid crystal regurgitation section, or considering as the composition of the liquid crystal regurgitation section which can move a regurgitation point at least according to the liquid crystal inlet of the substrate laid.

[0026] Drawing 4 is a cross section for explaining other operation gestalten of the liquid crystal injector of this invention. The composition shown in drawing 4 is equipped with the move mechanism 9, at least, movement of a regurgitation point is enabled by the control from the outside, and the liquid crystal regurgitation section 5 makes easy alignment of the liquid crystal regurgitation section 5 and the liquid crystal inlet of a substrate 10 by this.

[0027] In addition, constituting according to the mechanism to which the liquid crystal regurgitation section 5 whole is moved to a back face can also constitute the move mechanism 9 according to the mechanism to which only the regurgitation point of the liquid crystal regurgitation sections 5 is moved. Moreover, the move direction of this move mechanism can be made possible [movement in ** or two directions] for [on a flat surface] on the other hand to a back face, and movement of it in the height direction can still also be enabled.

[0028] Moreover, a heating means is prepared also in the liquid crystal regurgitation section 5, the fluidity of liquid crystal material is controlled, that it is easy to breathe out liquid crystal from a regurgitation point, it can carry out or dropping control of liquid crystal material can be performed.

[0029] Since according to the embodiment of this invention the programming rate of back-face temperature can be made quick and temperature distribution can be made uniform by forming the back face of a supporter for a good thermally conductive material, the programming rate of substrate temperature can be made quick, and let temperature distribution be a uniform thing.

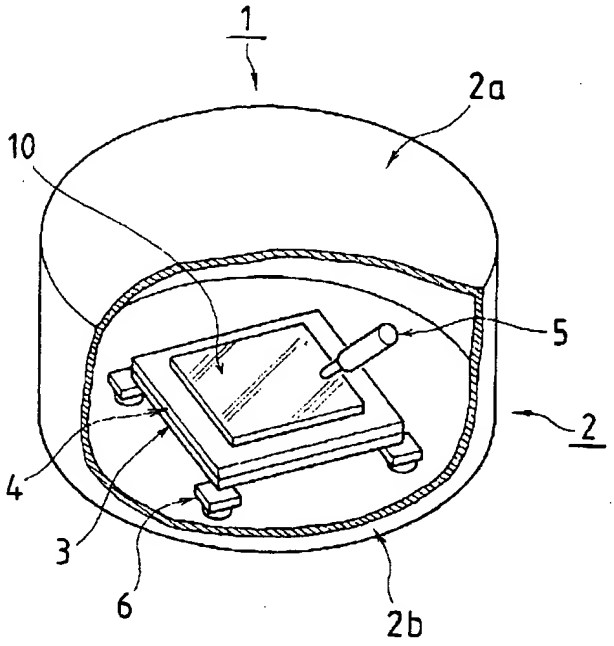
[0030] According to the embodiment of this invention, even if it is the case that liquid crystal material is little, liquid crystal pouring into a substrate can be performed. the operative condition of this invention -- if it depends like -- processing of liquid crystal pouring in the sealing state -- temperature -- since things are made, mixing of an impurity can be prevented and scattering to other parts of liquid crystal material and adhesion can be prevented

[0031] According to the embodiment of this invention, since the application of the liquid crystal material to parts other than the liquid crystal inlet of a substrate can be decreased, the time of the wiping process of the liquid crystal material which dispersed can be shortened. According to the embodiment of this invention, since a substrate is not heated using a blower, it can prevent a particle adhering to a substrate or liquid crystal material by the gaseous flow, and contamination of a substrate side or liquid crystal material can be prevented by this.

[0032]

[Effect of the Invention] As explained above, according to the liquid crystal injector of this invention, the whole substrate can be heated to uniform temperature and a substrate can be set as predetermined temperature.

Drawing selection [Representative drawing]



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JAPANESE [JP,10-260415,A]

CLAIMS DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART EFFECT OF THE INVENTION TECHNICAL PROBLEM MEANS DESCRIPTION OF DRAWINGS DRAWINGS

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